

Math Practice Worksheet

Algebra 1 · Geometry · 20 Problems · Self-Study Edition

PART 1 — ALGEBRA 1 (Word Problems)

[A-01 · ONE-STEP EQUATION]

◆ KEY: 'more than' → add · 'less than' → subtract · isolate variable by doing SAME op to both sides

Sarah has some stickers. After her friend gives her **14** more stickers, she has **31** stickers total. Which equation represents this situation, and how many stickers did Sarah start with?

- (A) $x + 14 = 31 \rightarrow x = 45$
- (B) $x + 14 = 31 \rightarrow x = 17$ ✓
- (C) $x - 14 = 31 \rightarrow x = 45$
- (D) $14x = 31 \rightarrow x \approx 2.2$

■ **Answer: (B) $x = 17$**

Explanation: $x + 14 = 31 \rightarrow$ subtract 14 from both sides $\rightarrow x = 17$. Common mistake: adding 14 to 31 (choosing A). Always use the INVERSE operation.

[A-02 · TWO-STEP EQUATION]

◆ KEY: PEMDAS reversed — undo Addition/Subtraction FIRST, then Multiplication/Division

A taxi charges a **\$3** flat fee plus **\$2** per mile. Marcus paid **\$17** total. How many miles did he travel?

$$3 + 2m = 17$$

- (A) 5 miles
- (B) 8 miles
- (C) 7 miles ✓
- (D) 10 miles

■ **Answer: (C) 7 miles**

Explanation: $3 + 2m = 17 \rightarrow$ subtract 3 $\rightarrow 2m = 14 \rightarrow$ divide by 2 $\rightarrow m = 7$. Common mistake: dividing 17 by 2 first and ignoring the flat fee.

[A-03 · DISTRIBUTIVE PROPERTY + PERIMETER]

◆ KEY: Distribute = multiply the outside number to EVERY term inside parentheses

A rectangle has perimeter **38 cm**. The length is **(2x + 3) cm** and the width is **4 cm**. Find x.

$$2(2x + 3) + 2(4) = 38 \rightarrow 4x + 6 + 8 = 38 \rightarrow 4x = 24 \rightarrow x = 6$$

- (A) $x = 6$ ✓
- (B) $x = 4$
- (C) $x = 7$
- (D) $x = 3$

■ Answer: (A) $x = 6$

Explanation: $4x + 14 = 38 \rightarrow 4x = 24 \rightarrow x = 6$. Check: length = $2(6)+3 = 15$, $P = 2(15)+2(4) = 38$ ✓. Common mistake: forgetting to distribute to both terms inside parentheses.

[A-04 · INEQUALITY]

◆ KEY: Multiply/divide by a NEGATIVE → FLIP the inequality sign (< becomes >)

Jake wants to spend **no more than \$50** on books. He already spent **\$18**. Each additional book costs **\$8**. What is the maximum number of additional books he can buy?

$$18 + 8b \leq 50$$

- (A) $b \leq 5$, max 5 books
- (B) $b \leq 3$, max 3 books
- (C) $b \leq 4$, max 4 books ✓
- (D) $b \leq 6$, max 6 books

■ Answer: (C) $b \leq 4$, maximum 4 books

Explanation: $18 + 8b \leq 50 \rightarrow 8b \leq 32 \rightarrow b \leq 4$. Common mistake: forgetting to subtract 18 first, or confusing 'no more than' (\leq) with 'less than' ($<$).

[A-05 · LINEAR FUNCTION]

◆ KEY: $y = mx + b$ · $m = \text{slope (rate of change)}$ · $b = y\text{-intercept (starting value)}$

A plant is **4 cm** tall when first measured. It grows **2 cm** every week. Which equation models the plant's height h after w weeks?

- (A) $h = 4w + 2$
- (B) $h = 2w + 4$ ✓
- (C) $h = 2w$
- (D) $h = 4w$

■ Answer: (B) $h = 2w + 4$

Explanation: Rate (slope) = 2 cm/week; starting height (intercept) = 4. Common mistake: swapping slope and intercept $\rightarrow h = 4w + 2$. The rate is always the coefficient of the variable.

[A-06 · SYSTEMS OF EQUATIONS]

◆ KEY: Substitution: isolate one variable, plug into the other equation

Two friends spend **\$12** total on snacks. Emma spends **\$2 more** than Liam. How much does each person spend?

$$e + l = 12 \text{ and } e = l + 2$$

- (A) Emma: \$6, Liam: \$6
- (B) Emma: \$7, Liam: \$5 ✓
- (C) Emma: \$8, Liam: \$4
- (D) Emma: \$5, Liam: \$7

■ Answer: (B) Emma: \$7, Liam: \$5

Explanation: Substitute $e = l + 2$ into $e + l = 12$: $(l+2)+l=12 \rightarrow 2l=10 \rightarrow l=5, e=7$. Common mistake: splitting \$12 equally (ignoring the \$2 difference).

[A-07 · SLOPE-INTERCEPT / LINEAR EVALUATION]

◆ KEY: $y = mx + b$ · plug in the x value to find y

A car rental costs a **\$25 base fee** plus **\$0.15 per mile**. What is the total cost for a **100-mile** trip?

$$C = 0.15m + 25$$

- (A) \$15
- (B) \$25
- (C) \$40 ✓
- (D) \$140

■ Answer: (C) \$40

Explanation: $C = 0.15(100) + 25 = 15 + 25 = \40 . Common mistake A: forgetting to add the base fee (only getting \$15). Common mistake D: multiplying everything by 100 incorrectly.

[A-08 · PROPORTIONS]

◆ KEY: Cross-multiply: $a/b = c/d$ becomes $ad = bc$

A recipe uses **3 cups of flour** to make **24 cookies**. How many cups of flour are needed to make **40 cookies**?

$$3/24 = x/40$$

- (A) 4 cups
- (B) 5 cups ✓
- (C) 6 cups
- (D) 8 cups

■ Answer: (B) 5 cups

Explanation: Cross multiply: $24x = 3 \times 40 = 120 \rightarrow x = 5$. Common mistake: adding the difference instead of cross-multiplying.

[A-09 · DISTANCE / RATE / TIME]

◆ KEY: $d = r \times t$ (Distance = Rate \times Time) · the DRT Triangle

Train A travels at **60 mph**. Train B travels at **80 mph** in the same direction, starting **1 hour later**. After Train B starts, how many hours until it catches Train A?

- (A) 2 hours
- (B) 4 hours
- (C) 3 hours ✓
- (D) 5 hours

■ Answer: (C) 3 hours

Explanation: When B starts, A has a 60-mile head start (1 hr \times 60 mph). B gains $80 - 60 = 20$ mph on A. Time = $60 \div 20 = 3$ hours. Verify: A travels 4 hrs total = 240 mi; B travels 3 hrs = 240 mi ✓

[A-10 · PERCENT / SEQUENTIAL DISCOUNTS]

◆ KEY: Two discounts applied sequentially \neq adding percentages · 20% off = multiply by 0.80

A jacket costs **\$80**. It is on sale for **25% off**, then an additional **10% off** is applied. What is the final price? (Two discounts are NOT the same as 35% off!)

- (A) \$28
- (B) \$44
- (C) \$54 ✓
- (D) \$52 (common wrong answer: 35% off in one step)

■ Answer: (C) \$54

Explanation: Step 1: $\$80 \times 0.75 = \60 . Step 2: $\$60 \times 0.90 = \54 . Common mistake (D): combining $25 + 10 = 35\%$, giving $\$80 \times 0.65 = \52 . Sequential discounts must be applied one at a time — they compound.

PART 2 — GEOMETRY (Word Problems)

[G-01 · SUPPLEMENTARY ANGLES]

◆ KEY: Supplementary = sum to 180° · Complementary = sum to 90°

Two angles are supplementary. One measures **$(3x + 10)^\circ$** and the other **$(x + 30)^\circ$** . Find x and both angle measures.

$$(3x + 10) + (x + 30) = 180$$

- (A) $x = 30$; angles: 100° and 60°
- (B) $x = 40$; angles: 130° and 70°
- (C) $x = 35$; angles: 115° and 65° ✓
- (D) $x = 25$; angles: 85° and 55°

■ Answer: (C) $x = 35$; 115° and 65°

Explanation: $4x + 40 = 180 \rightarrow 4x = 140 \rightarrow x = 35$. Angles: $3(35) + 10 = 115^\circ$; $35 + 30 = 65^\circ$. Check: $115 + 65 = 180^\circ$ ✓

[G-02 · TRIANGLE ANGLE SUM]

◆ KEY: All triangles: $angle1 + angle2 + angle3 = 180^\circ$ ALWAYS

In a triangle, one angle is **90°**. Another angle is **twice the third angle**. Find the two unknown angles.

- (A) 45° and 90°
- (B) 30° and 60° ✓
- (C) 40° and 80°
- (D) 50° and 40°

■ Answer: (B) 30° and 60°

Explanation: Let smaller angle = x ; larger = $2x$. $90 + x + 2x = 180 \rightarrow 3x = 90 \rightarrow x = 30^\circ$, $2x = 60^\circ$. Common mistake: assuming the other two angles are equal (45° each). 'Twice' means one is double the other.

[G-03 · PYTHAGOREAN THEOREM]

◆ KEY: $a^2 + b^2 = c^2$ · $c = \text{hypotenuse}$ (longest side, opposite the right angle)

A ladder leans against a wall. Its base is **6 feet** from the wall; it reaches **8 feet** up the wall. How long is the ladder?

$$6^2 + 8^2 = c^2 \rightarrow 36 + 64 = 100 \rightarrow c = \sqrt{100}$$

- (A) 12 feet
- (B) 9 feet
- (C) 10 feet ✓
- (D) 14 feet

■ Answer: (C) 10 feet

Explanation: $6^2 + 8^2 = 36 + 64 = 100$; $\sqrt{100} = 10$ feet. This is the 6-8-10 triple (double of 3-4-5). Memorize common triples: 3-4-5, 5-12-13, 8-15-17.

[G-04 · AREA OF A TRIANGLE]

◆ KEY: $A = \frac{1}{2} \times \text{base} \times \text{height}$ · height must be PERPENDICULAR to the base

A triangular garden has a **base of 14 m** and a **height of 9 m**. What is the area?

$$A = \frac{1}{2} \times 14 \times 9$$

- (A) 126 m²
- (B) 63 m² ✓
- (C) 46 m²
- (D) 72 m²

■ Answer: (B) 63 m²

Explanation: $A = \frac{1}{2} \times 14 \times 9 = \frac{1}{2} \times 126 = 63$ m². Common mistake: forgetting the $\frac{1}{2}$ → getting 126 (choice A). Triangles are always half the rectangle with same base & height.

[G-05 · AREA OF A CIRCLE]

◆ KEY: $A = \pi r^2$ · Circumference = $2\pi r$ · RADIUS = diameter $\div 2$

A circular pool has a **diameter of 10 meters**. What is the area? (Use $\pi \approx 3.14$)

$$\text{radius} = 10 \div 2 = 5 \text{ m} \rightarrow A = 3.14 \times 5^2$$

- (A) 314 m² (diameter used by mistake)
- (B) 31.4 m²
- (C) 78.5 m² ✓
- (D) 62.8 m²

■ Answer: (C) 78.5 m²

Explanation: Radius = 5. $A = 3.14 \times 25 = 78.5$ m². Common mistake: using diameter (10) instead of radius $\rightarrow 3.14 \times 100 = 314$. ALWAYS halve the diameter first!

[G-06 · PERIMETER OF L-SHAPE]

◆ KEY: Perimeter = sum of ALL outer sides · Find missing sides using the total dimensions

An L-shaped room has total outer dimensions **10 m × 8 m**. A **4 m × 3 m** rectangle is cut from one corner. What is the perimeter of the L-shape?

$$\text{sides: } 10 + 8 + 4 + 3 + (10-4) + (8-3) = 10+8+4+3+6+5$$

- (A) 36 m ✓
- (B) 44 m
- (C) 40 m
- (D) 30 m

■ Answer: (A) 36 m

Explanation: The six sides are: 10, 8, 4, 3, 6, 5 \rightarrow sum = 36 m. Key insight: the two 'notch' sides equal the two sides they replaced. L-shape perimeter = same as the full outer rectangle perimeter = $2(10+8) = 36$ m.

[G-07 · SIMILAR TRIANGLES / SHADOW PROBLEM]

◆ KEY: Similar triangles \rightarrow corresponding sides are PROPORTIONAL · set up ratio, cross-multiply

A tree casts a shadow **15 feet** long. At the same time, a **5-foot-tall** person casts a **3-foot** shadow. How tall is the tree?

$$\text{tree height} / 15 = 5 / 3$$

- (A) 20 feet
- (B) 30 feet
- (C) 25 feet ✓
- (D) 45 feet

■ Answer: (C) 25 feet

Explanation: $h/15 = 5/3 \rightarrow h = (15 \times 5)/3 = 25$ feet. Common mistake: incorrect ratio setup ($15/5 = h/3 \rightarrow h = 9$). Always match height-to-shadow consistently on both sides.

[G-08 · VOLUME OF RECTANGULAR PRISM]

◆ KEY: $V = l \times w \times h$ · Volume is always in CUBIC units (3)

A storage box is **5 ft long, 3 ft wide, and 2 ft tall**. How many boxes fit in a room with volume **240 ft³**?

$$V = 5 \times 3 \times 2 = ? \rightarrow 240 \div V = \text{number of boxes}$$

- (A) $V = 20 \text{ ft}^3$; 12 boxes
- (B) $V = 30 \text{ ft}^3$; 8 boxes ✓
- (C) $V = 60 \text{ ft}^3$; 4 boxes
- (D) $V = 10 \text{ ft}^3$; 24 boxes

■ Answer: (B) $V = 30 \text{ ft}^3$; 8 boxes

Explanation: $V = 5 \times 3 \times 2 = 30 \text{ ft}^3$. Boxes = $240 \div 30 = 8$. Common mistake: adding dimensions ($5+3+2=10$) instead of multiplying. Volume is always a 3D multiplication.

[G-09 · PARALLEL LINES & TRANSVERSAL]

◆ KEY: Alternate Interior Angles = EQUAL · Co-interior (same-side) = sum to 180°

Two parallel lines are cut by a transversal. Co-interior angles measure **$(5x - 20)^\circ$** and **$(3x + 40)^\circ$** . Find x and both angle measures.

$$(5x - 20) + (3x + 40) = 180$$

- (A) $x = 20$; 80° and 100° ✓
- (B) $x = 25$; 105° and 75°
- (C) $x = 15$; 55° and 85°
- (D) $x = 30$; 130° and 50°

■ Answer: (A) $x = 20$; 80° and 100°

Explanation: $8x + 20 = 180 \rightarrow 8x = 160 \rightarrow x = 20$. Angles: $5(20) - 20 = 80^\circ$; $3(20) + 40 = 100^\circ$. Check: $80 + 100 = 180^\circ$ ✓ (co-interior are supplementary).

[G-10 · CIRCUMFERENCE & DISTANCE]

◆ KEY: $C = 2\pi r = \pi d$ · distance traveled = circumference \times number of rotations

A bicycle wheel has a **diameter of 26 inches**. How far does it travel in **10 full rotations**? (Use $\pi \approx 3.14$)

$$C = \pi \times d = 3.14 \times 26 \rightarrow \text{distance} = C \times 10$$

- (A) 81.64 inches (only 1 rotation)
- (B) 260 inches
- (C) 816.4 inches ✓
- (D) 530.66 inches

■ Answer: (C) 816.4 inches

Explanation: $C = 3.14 \times 26 = 81.64$ inches/rotation. 10 rotations = $81.64 \times 10 = 816.4$ inches. Common mistake: forgetting to multiply by 10 (choosing A). Each rotation covers exactly one circumference.